

US EPA ARCHIVE DOCUMENT



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MEMORANDUM

SUBJECT: Metolachlor Drinking Water Concentrations: First Tier Acute and Chronic
Exposure Assessments for Surface and Groundwater as a Result of Uses on Carrots,
Peppers, and Grass.

Chemical Number: 108801

DP Barcodes: D239868

D239860

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Rem / Birchfield for Sharon Jones 3/20/98

Executive Summary:

Based on fate characteristics, model predictions and actual monitoring studies, the Agency predicts that metolachlor used for weed control on carrots (in muck soil), peppers, and grasses (grown for seed) will reach surface and ground water. Metolachlor has been detected in many ground water samples and streams. It is poorly retained on soils ($K_d = 0.08$ to 4.81) and relatively persistent (aerobic soil $t_{1/2} = 68$ days, aerobic aquatic $t_{1/2} = 47$ days). Recommended first tier drinking water concentrations associated with metolachlor uses on carrots (in muck soils), grasses, and peppers and monitoring data are presented in Table 1. This assessment was conducted under guidelines stated in OPP's Interim Approach for Addressing Drinking Water Exposure (November 1997).

Two metabolites of metolachlor, 2-[2-(2-ethyl-6-methylphenyl)amino]-1-propanol and 4-[(2-ethyl-6-methylphenyl)-2-hydroxy-5-methyl-3-morpholino] are reported to be in the tolerance expression in the version of 40 CFR part 180.368 dated July 1, 1997. However, EFED understands that HED has characterized the ethanesulfonate acid (ESA) and oxanilic acid degradates of alachlor as toxic and is currently considering whether analogous degradates of

other acetanilide herbicides such as metolachlor are also of concern. This water assessment solely addresses the active ingredient metolachlor; EFED awaits HED's guidance on which degradates of metolachlor should also be included in a first tier drinking water assessment.

Table 1. Recommended drinking water concentrations associated with metolachlor uses on carrots (in muck soils), grasses, and peppers (Tier I).

use / exposure type	surface water		ground water	
	estimated concentration (ppb)	source of concentration	estimated concentration (ppb)	source of concentration
carrots / acute	167	GENEEC peak	157	USEPA 1992
carrots / chronic	111	GENEEC 56-day ave		
grass & peppers / acute	111	GENEEC peak		
grass & peppers / chronic	75.9	GENEEC 56-day ave		

Environmental Fate

Although the environmental fate data base is not complete the information from all acceptable and upgradable environmental fate data indicate that parent metolachlor appears to be moderately persistent to persistent. It also ranges from mobile to highly mobile in different soils and it has been detected in ground water. Metolachlor degradation appears to be dependent on microbially mediated (aerobic soil metabolism $t_{1/2}$ = 68 days, anaerobic soil metabolism $t_{1/2}$ = 81 days) and abiotic processes (photodegradation in water $t_{1/2}$ = 70 days under natural sunlight and photodegradation on soil $t_{1/2}$ = 8 days under natural sunlight). Most recent aerobic soil degradation studies (supplemental) suggest a biphasic half-life for metolachlor of 8 and 68 days. As this study was not acceptable nor consistent with previous studies the more conservative half-life of 68 days was multiplied by a factor of three to estimate a 90th percentile half-life value (204 days) used in GENEEC modeling. The major degradates were identified as CGA-51202, CGA-50720, CGA-41638, CGA-37735, and CGA-13656. Depending on the soil characteristics, metolachlor has the potential to range from a moderately mobile to a highly mobile material (K_d values ranging from 0.08 to 4.81). Field dissipation studies indicate that metolachlor is persistent in the surface soil ($t_{1/2}$ ranging from 7 to 292 days in the upper six inch soil layer). Metolachlor was reportedly detected as far as the 36 to 48 inch soil layer in some of the studies. The degradate CGA-51202 was detected (0.11 ppm) as far as the 30-36 inch soil depth (MRID No. 41335701); CGA-40172 was detected as far as the 36-48 inch depth (MRID No. 41309802); CGA-40172 was detected as far as the 36-48 inch depth (MRID No. 41309802); CGA-40919 was detected in the 36-48 inch depth (0.21 ppm in MRID No. 41309802); and CGA-50720 was not detected (0.07 ppm) in any soil segment at any interval.

SURFACE WATER ASSESSMENT:

EFED uses the GENEEC screening model to estimate surface water concentrations for first-tier

exposure assessments. GENEEC (USEPA 1995) is a screening model designed by the Environmental Fate and Effects Division (EFED) to estimate the concentrations found in surface water for use in ecological risk assessment. As such, it provides upper-bound values on the concentrations that might be found in ecologically sensitive environments because of the use of a pesticide. It was designed to be simple and require data which is typically available early in the pesticide registration process. GENEEC is a single event model (one runoff event), but can account for spray drift from multiple applications. GENEEC is hardwired to represent a 10-hectare field immediately adjacent to a 1-hectare pond that is 2 meters deep with no outlet. The pond receives a spray drift event from each application plus one runoff event. The runoff event moves a maximum of 10% of the applied pesticide into the pond. This amount can be reduced due to degradation on the field and the effects of soil binding in the field. Spray drift is equal to 1 and 5% of the applied rate for ground and aerial spray application, respectively.

Based on fate studies, the organic content of soil is expected to increase metolachlor adsorption. Thus muck soils as proposed for carrots would be expected to decrease metolachlor mobility relative to sandy, low organic content soils. This allowance has been incorporated into GENEEC calculations by using a K_d derived from two higher organic content soils. For peppers and grass K_d values from four soils, including one low organic content soil and one silty soil, were averaged. Based on the properties of metolachlor in soil and water the GENEEC model predicts that levels as high as 167 ppb may be found in surface water as a result of proposed uses. Monitoring data released by USGS (1997) confirm that metolachlor is often found in surface waters. Metolachlor was found in 61%, 72%, and 48% of streams at levels greater than 10 ppt in agricultural, mixed land use, and urban streams.

Acute exposure

EFED recommends that 167 ppb be adopted as a conservative estimate of *acute* drinking-water exposure for metolachlor based GENEEC modeling and the use pattern for carrots.

Chronic exposure

EFED recommends that 111 ppb be adopted as a conservative estimate of *chronic* drinking-water exposure for metolachlor based on concentrations for the 56 day average GENEEC value obtained with use on carrots.

GROUND WATER ASSESSMENT:

The pesticide in ground water data base indicates that residues of metolachlor were detected in wells in 20 states. Levels exceeded the Health Advisory level (100 µg/l) in 3 wells located in Wisconsin, New York, and Missouri. The maximum measured concentration was 157 ppb. In eight other states concentrations in some well waters exceeded 10% of the HA. SCIGROW2 predicts a maximum ground water screening concentration of 15.3 ppb for use on carrots in high organic content soils. EFED recommends that 157 ppb be adopted as a conservative estimate of ground water exposure for metolachlor based on monitoring data presented in Pesticides in Surface and Ground Water of the United States: Preliminary Results of the National Water Quality Assessment Program (USEPA 1992).

Table 2. GENEEC Environmental Fate Input Parameters.

DATA INPUT	INPUT VALUE	DATA ASSESSMENT	SOURCE
Application Rate	2.0-4.0 lbs ai/A	acceptable	label addenda
Maximum Number of Applications	1	acceptable	label addenda
Koc: (derived from K_d reported in column leaching study) carrots (muck soil >20% OM) pepper (all types) and grasses	96.2 (Iowa, 5.0% OM) 87.9 (Maryland, 4.8% OM) Ave (n=2) 92.1 8.89 (Maryland, 0.9% OM) 198 (Miss., 2.38% OM) Ave (n=4) 97.7	supplemental	MRID 40494602
Aerobic Soil Metabolism	68 days (second rate of biphasic process) 204 days (used in model)	supplemental	MRID 43928936
Solubility	530 ppm	acceptable	Reported by registrant
Aerobic Aquatic Metabolism	$t_{1/2}$ =47 days	supplemental	MRID 41185761
Hydrolysis	stable	acceptable	MRID 40430201
Aquatic photolysis	$t_{1/2}$ = 70 days	supplemental	MRID 40430202

Table 3. GENEEC and SCIGROW2 EECs ($\mu\text{g/L}$) for metolachlor on carrots (in muck soils), peppers, and grasses.

rate (lbs ai/A)	crop	application		GENEEC EEC ($\mu\text{g/L}$)		SCIGROW2 ($\mu\text{g/L}$)
		method	max # annually	peak	56-day ave	screening concentration
4.0	carrot (muck soils)	ground	1	167	111	15.3
2.0	grasses grown for seed	ground	1	82	54.5	7.05
2.0	peppers (all types)	ground	1	82	54.5	7.05

REFERENCES

U.S. Environmental Protection Agency. 1992. Pesticides in Ground Water Database - A Compilation of Monitoring Studies: 1971- 1991. Office of Prevention, Pesticides, and Toxic Substances, EPA 734-12-92-001, September 1992.

U.S. Geological Survey. 1997. Pesticides in Surface and Ground Water of the United States: Preliminary Results of the National Water Quality Assessment Program. Pesticides National Synthesis Project.